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RELATIONSHIPS OF THE NEOTROPICAL CATFISH GENUS *NEMUROGLANIS,* WITH A DESCRIPTION OF A NEW SPECIES (OSTEICHTHYS: SILURIFORMES: PIMELODIDAE)

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Abstract.—A new species of the Neotropical catfish genus *Nemuroglanis* is described from material from the Río Negro and Río Orinoco. Osteological characters place the genus within a large, previously recognized but unnamed clade of the Pimelodidae which contains most of the smaller sized members of the family. A more restrictive clade, which contains *Nemuroglanis* and members of several other pimelodid genera, is defined on characteristics of the fin spines and transverse processes of the anterior vertebrae.

Resumen.—Una nueva especie de pez siluriforme (bagre) perteneciente al género neotropical *Nemuroglanis* se describe del material procedente de los ríos Negro e Orinoco. Los caracteres osteológicos encontrados permiten incluir al género dentro de un clado grande, previamente reconocido, pero sin nombre, de los Pimelodidae el cual contiene la mayor parte de los miembros de tamaño pequeño de la familia. Un clado más restringido, que contiene a *Nemuroglanis* y a miembros de varios otros géneros de pimelodidos se define en base a las características de las espinas de las aletas y a los procesos tranversales de las vertebras anteriores.

The pimelodid catfish genus *Nemuroglanis* has been a taxonomic enigma since it was first described. Eigenmann & Eigenmann (1889) proposed the name for a new species, *N. lanceolatus,* based on a single specimen taken by the Thayer expedition to Brazil. While undoubtedly a new species and a member of the Pimelodidae, as currently construed, the relationships of this fish within the family remained obscure. Until quite recently, our knowledge of the species and genus was based entirely on a single, fragile, 23.5 mm standard length (SL) specimen and a brief and inaccurate original description.

Eigenmann & Eigenmann (1889) stated firmly, but incorrectly, that *Nemuroglanis* belonged to a sub-group of pimelodids with toothed vomers, a group that otherwise contained only the largest of the Pimelodidae. Gosline (1941), however, included *Nemuroglanis* in his study of those pimelodids without a free orbital rim although no other pimelodid with a toothed vomer was included, and despite his comment that it was impossible to tell from the original description whether the genus had a free orbital rim. Recent efforts to elucidate the relationships within the Pimelodidae (e.g., Hassur 1970, Stewart 1986, and Lundberg & McDade 1986) have, of necessity, had to ignore *Nemuroglanis.* Fortunately, in this time of active investigation of the relationships of Neotropical catfishes, recent collecting in the Río Negro and Río Orinoco of Venezuela has uncovered a number of specimens of a species which, while not conspecific, are closely related to *Nemuroglanis lanceolatus.* The new species is described and figured herein, and aspects of the anat-

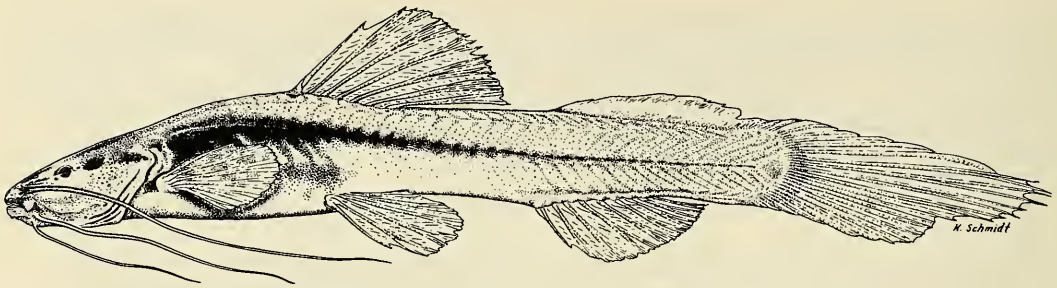

Fig. 1. *Nemuroglanis pauciradiatus,* paratype, AMNH 74410, 29.5 mm SL.

omy of this new species are discussed. This anatomical information helps shed some light on the relationship of *Nemuroglanis* within the Pimelodidae.

Materials and methods.—Measurements were made with a Helios dial caliper, to 0.5 mm, or with an ocular micrometer and a Wild M-5 dissecting microscope, to 0.1 mm. Vertebral counts were made from radiographs and cleared-and-stained specimens. Total vertebral counts include five for the Weberian complex and one for the ural complex. When meristics vary, the count for the holotype is indicated by an asterisk (*). Specimens examined during this study are deposited in the following institutions: American Museum of Natural History, New York (AMNH); Academy of Natural Sciences, Philadelphia (ANSP); California Academy of Sciences, San Francisco (CAS); Field Museum of Natural History, Chicago (FMNH); Museo de Biologia, Universidad Central de Venezuela, Caracas (MBUCV); Museum of Comparative Anatomy, Harvard University, Cambridge (MCZ); Museu Zoologia de Universidade do Sao Paulo (MZUSP); National Museum of Natural History, Washington (USNM). Anatomical illustrations were made with a camera lucida, from a single, partially disarticulated, alcian blue-alizarin stained specimen (AMNH 74410). In all anatomical drawings bone is indicated by stippling and cartilage by open circles.

The following cleared-and-stained specimens of the *Brachyrhamdia* clade of the Pimelodidae were examined in conjunction with the discussion of relationship of *Nemuroglanis*: *Leptorhamdia* sp. AMNH 74403; *Brachyglanis* sp. AMNH 74394; *B. magoi* MBUCV-V-2600; *Myoglanis* sp. AMNH 74407. Of the *Brachyrhamdia* subclade: *Pimelodella chagresi* AMNH 11406; *Goeldiella eques* AMNH 13660; *Rhamdia guatemalensis* AMNH 24871; *R. quelen* AMNH 54796. Of the *Nemuroglanis* subclade: *Nannorhamdia* sp. AMNH 74408, AMNH 77000; *Chasmocranus rosae* ANSP 137968; *Heptapterus* sp. AMNH 8668.

Genus *Nemuroglanis* Eigenmann & Eigenmann

Nemuroglanis Eigenmann & Eigenmann, 1889:29 (type species, *Nemuroglanis lanceolatus* Eigenmann & Eigenmann, 1889, by original designation).

Diagnosis.—A genus of pimelodid catfishes of the *Brachyrhamdia* clade (sensu Lundberg & McDade, 1986) characterized by a lanceolate caudal fin.

Nemuroglanis pauciradiatus, new species
Fig. 1

Diagnosis.—A species of *Nemuroglanis* with 11 or fewer anal rays. The only known congener, *N. lanceolatus,* has 14 anal fin rays.

Holotype.—MBUCV-V-16450, 27.5 mm (SL), Venezuela: Territorio Federal Amazonas; morichal 26.9 km from Puerto Aya-

Table 1.—Measurements of *Nemuroglanis lanceolatus* and *N. pauciradiatus*. All measurements, except total length and standard length, are expressed as thousandths of standard length.

	N. lanceolatus Holotype	*N. pauciradiatus*		
		Holotype	Paratypes (n = 10)	
			Mean	Range
Total length (mm)	—	39.5		23.0–54.5
Standard length (mm)	23.5	27.5		19.5–35.5
Predorsal length	387	334	360.3	332–390
Head length	204	182	201.7	189–231
Dorsal-fin base length	98	142	143.2	123–174
Snout length	68	69	67.6	63–72
Eye diameter	26	29	30.3	23–38
Interorbital width	60	58	57.5	46–68
Snout to pelvic fin length	430	389	419.2	397–458
Snout to anal fin length	660	655	697.4	661–772
Anal-fin base length	209	146	143.3	123–164
Caudal peduncle length	115	182	152.3	127–185
Caudal pecundle depth	64	91	91.5	84–97

cucho along Puerto Ayacucho to Caicara highway; 15 Nov 1985; B. Chernoff, W. Saul, R. Royero.

Paratypes.—MBUCV-V-16451, 2, 23.0–26.0 mm SL; ANSP 159030, 12, 21.5–27.5 mm SL; MZUSP 37274 and 37275, 2, 26.0–26.5 mm SL, FMNH 97121, 2, 23.0–26.0 mm SL, taken with holotype. AMNH 74410, 3, (29.5–35.5 mm SL, one specimen cleared and alcian blue-alizarin stained), Venezuela: Territorio Federal Amazonas; Departamento Río Negro; Río Mawarinuma, 4 km downstream of Neblina base camp on left bank, in isolated pools along dried river bank, 0°55′N, 66°10′W, elevation 120 m, 7 Feb 1984, 1100–1300 hrs, C. J. Ferraris, G. Nelson, and R. Royero. AMNH 74411, 1, 28.5 mm SL. Venezuela: Territorio Federal Amazonas; Departamento Río Negro; Río Mawarinuma, at Neblina base camp, 0°55′N, 66°10′W, elevation 120 m, 11 Feb 1984, 1000–1500 hrs, C. J. Ferraris, R. Royero, and G. Nelson. USNM 268645, 1, 19.5 mm SL, Venezuela: Territorio Federal Amazonas; Departamento Río Negro, Rocky pool on island in center of Río Negro, 01°57′N, 67°03′W, 4 Dec 1984, R. P. Vari et al. USNM 268646, 1, 24.5 mm SL, Venezuela: Territorio Federal Amazonas; Departamento Ature, caño about 15 km south of El Burro, on road from Puerto Ayacucho to El Burro, 06°02′N, 67°23′W, 9 Dec 1984, R. P. Vari et al. CAS 57949, 3, 20.0–28.5 mm SL, Brazil, Amazonas, Rio Negro at São Gabriel, rock pools below rapids, Carl Ternetz, 1 Feb 1925.

Description.—A summary of the morphometric values for this species and the holotype of *Nemuroglanis lanceolatus* (MCZ 8169) is presented in Table 1.

Body cylindrical anteriorly, becoming strongly compressed caudally. Vertebral column with 38 or 39 vertebrae, 5 or 6 vertebrae bearing ribs. Head depressed, dorsal profile slightly convex. Eyes covered with skin (without free orbital margin), partially obscured ventrally by enlarged adductor mandibulae muscle mass. Mouth terminal, jaws equal. Jaw teeth fine, conical, in bands. Palate without teeth. Seven branchiostegal rays. Six short gill rakers on ceratobranchial of first arch, none on epibranchial. Three pairs of barbels. Maxillary barbels long, reaching to beneath dorsal fin. Both sets of mental barbels reaching below pectoral fin. Outer mental barbels longer.

Lateral line canal on body extending posteriorly only to below dorsal-fin origin. Ce-

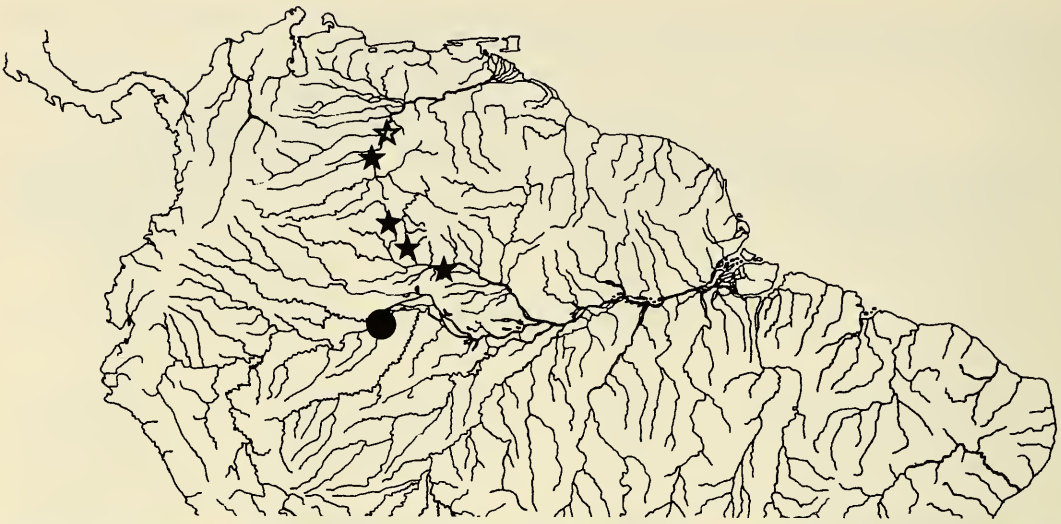

Fig. 2. Type localities of *Nemuroglanis lanceolatus* (circle) and *N. pauciradiatus* (open star). Additional collection localities of *N. pauciradiatus* (solid star).

phalic canals well developed, with an unusual connection and medial pore between nasal canals, in vicinity of posterior nostril.

Dorsal-fin origin remote from head, distance from tip of supraoccipital spine to dorsal-fin origin approximately equal to head length, origin of fin immediately behind posterior extent of appressed pectoral fin, or just anterior to vertical line at pelvic-fin origin. First dorsal "spine" absent, second "spine" filamentous. Branched dorsal-fin rays usually 6*, rarely 5; all branched rays of approximately equal length; fin margin slightly rounded. Appressed dorsal fin not reaching origin of adipose dorsal fin.

Adipose dorsal fin long, low, confluent with caudal fin. Origin of adipose along vertical running through anterior third of anal fin.

Pectoral fin margin rounded, not reaching pelvic fin base. Basal half of first ray stiffened, distal half segmented, not pungent. Rays uniformly 8 (except for single specimen from the Río Orinoco which lacks all rays but first), first and, sometimes, last, pectoral fin-ray unbranched.

Pelvic fin insertion on a vertical through middle of rayed dorsal fin. Appressed pelvic fin not reaching anal-fin base. Fin margin rounded. Rays uniformly i,5.

Anal fin short. Origin in advance of vertical through origin of adipose dorsal fin. Fin margin straight or slightly convex, all rays except first two of approximately equal size. Tip of appressed fin does not reach to caudal-fin base. Anal-fin rays 10 or 11*, anterior 3 to 5* unbranched, remaining rays branched.

Caudal fin shape unusual, called lanceolate by Eigenmann & Eigenmann (1889). Beginning at posterior margin of the adipose dorsal fin, procurrent caudal-fin rays become progressively longer. Three most dorsal branched rays of fin longest and subequal. Fin shortens abruptly between third and fifth branched ray; remaining branched rays of approximately equal length. Caudal-fin rays usually i,5,4,i*, rarely i,4,4,i. Upper procurrent rays 10–13*, lower 6–9*.

Pigmentation pattern in alcohol.—Overall body color light with scattered melanophores. Fine mid-dorsal stripe runs from nape to the adipose dorsal fin, most noticeable at dorsal fin. Midlateral stripe extends from just behind head, along the lateral line; stripe broad above pectoral-fin base, de-

creasing in width along abdomen, thin or absent posterior of vertical through rear of dorsal fin. Width and posterior extent of stripe varies considerably and hardly noticeable in some individuals. In individuals with dark stripes, a second oblique stripe extends from above pectoral-fin origin to just above pelvic-fin base. Eye stripe extends from snout margin through eye, after which it turns abruptly ventrally, and onto opercle. Below eye stripe, cheek remarkably light, as are undersides of the head and belly. Dorsal, adipose, and caudal fins have some scattered melanophores, but without detectable pattern. Remaining fins clear. The illustrated paratype (Fig. 1) the most darkly pigmented of the examined specimens.

Etymology.—The trivial name is derived from *paucus,* Latin for few, and *radiatus,* Latin for rayed, referring to the relatively low number of anal-fin rays in this species, relative to that of its congener.

Distribution.—*Nemuroglanis pauciradiatus* is currently known from the upper Río Negro of Brazil and Venezuela, the middle Río Orinoco, and the Río Baria system, which originates in the Cérro de la Neblina and empties into Rio Casiquiare (Fig. 2). *Nemuroglanis lanceolatus* is known at present only from the Río Amazonas, at Juthay, Brazil.

Discussion.—As stated in the diagnosis, this species can be distinguished from its congener, *N. lanceolatus* by anal-fin ray counts. Typically, *N. pauciradiatus* has 10 rays with the posterior 5 to 7 branched. The holotype of *N. lanceolatus* has 14 anal-fin rays, only three of which are branched. The difference in anal-fin ray count is reflected in relative anal-fin base length and caudal peduncle length (Table 1). *Nemuroglanis lanceolatus,* with a greater number of anal-fin rays, has a substantially longer fin base and concomitantly reduced caudal peduncle length. The caudal fin of *N. pauciradiatus* typically has 9 branched rays, whereas in the holotype of *N. lanceolatus* only the 4 longest rays are branched. *Nemuroglanis lanceolatus* has 41 vertebrae, two more than any examined specimen of *N. pauciradiatus.*

The color pattern of *Nemuroglanis lanceolatus* is described by Eigenmann & Eigenmann (1889) as uniform yellow, and reconfirmed by examination of the holotype. It appears, however, that the color is the result of loss of melanophores through bleaching and yellowing of the underlying muscle, a condition found in much of the Thayer expedition material. Thus, it is not possible at this time to determine the true pigment pattern of *N. lanceolatus.*

With the exception of fin ray counts noted above and, possibly, pigmentation, *N. pauciradiatus* is very similar in appearance to *N. lanceolatus* and is confidently placed into the same genus. In the absence of specimens of *N. lanceolatus* for anatomical examination, we are limited to data from *N. pauciradiatus* in determining relationships of *Nemuroglanis* within the Pimelodidae.

Relationships of Nemuroglanis.—*Nemuroglanis* belongs to a currently unnamed subgroup within the family Pimelodidae recently delimited by Lundberg & McDade (1986). That lineage, here termed the *Brachyrhamdia* clade, was recognized by three derived characters. The first of these is a bifurcation or even multifurcation of the posterior transverse process of the complex centrum. The second is a laterally directed, recurved process off the ventral surface of the mesethmoid (their supraethmoid). The third character is a median osseus lamina which extends between the neural spines of the complex centrum.

Nemuroglanis shows these characters quite clearly. The transverse process of the complex centrum (Fig. 3) branches twice. A basal split divides the process into a larger anterior portion and a broad posterior triangle. The anterior portion has a more lateral secondary split which is rejoined distally into a broad plate. The mesethmoid (Fig. 4) shape is identical to that of *Brachyrhamdia imitator,* as illustrated by Lund-

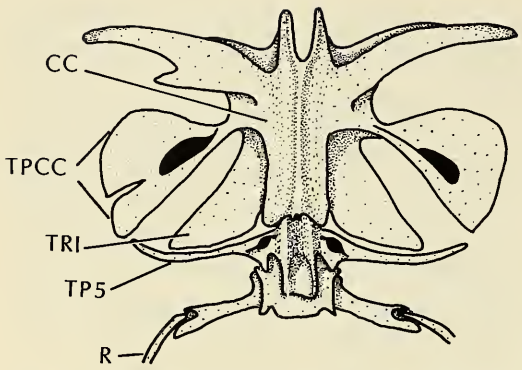

Fig. 3. Dorsal view of complex centrum and fifth vertebra of *Nemuroglanis pauciradiatus*. Abbreviations: CC—complex centrum; R—6th pleural rib; TP CC—posterior transverse process of complex centrum; TP 5—transverse process of fifth vertebra; TRI—triangular lamina of transverse process of complex centrum.

berg & McDade (1986). A lateral, scythe-shaped osseus lamina extends from the posteroventral base of the mesethmoid. This lamina is widely separated from the lateral ethmoid, but is connected to it by a broad flattened sheet of cartilage.

In *Nemuroglanis, Brachyrhamdia,* and all other members of the *Brachyrhamdia* clade examined by me, an additional character supports the hypothesis of monophyly of the group. The quadrate (Fig. 5) has separate hyomandibular- and metapterygoid-articular surfaces, which appear as posterior and

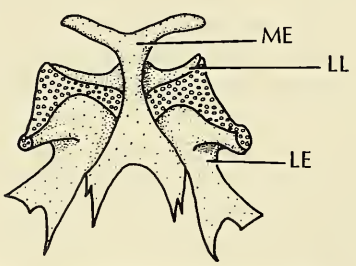

Fig. 4. Dorsal view of mesethmoid and lateral ethmoids of *Nemuroglanis pauciradiatus*. Abbreviations: ME—mesethmoid; LE—lateral ethmoid; LL—lateral lamina of mesethmoid.

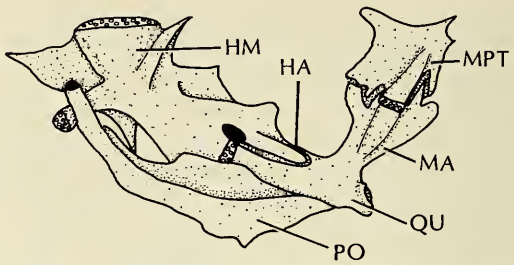

Fig. 5. Lateral view of right suspensorium of *Nemuroglanis pauciradiatus*. Abbreviations: HA—hyomandibular arm of quadrate; HM—hyomandibula; MA—metapterygoid arm of quadrate; MPT—metapterygoid; PO—preopercle; QU—quadrate.

anterior projecting arms, respectively. In most catfishes, and in pimelodids outside of the *Brachyrhamdia* clade, the articular surface of the quadrate is broadly convex and it has either a single cartilagenous articular surface for the suspensorium elements or the region between the articulation of the hyomandibular and metapterygoid facets is convex. Further, the hyomandibula and metapterygoid are broadly conjoined via an interdigitating suture dorsal to the quadrate, as is shown in *Diplomystes* (Fink & Fink 1981, p. 318, Fig. 11). Although a bifid quadrate is not unique to the *Brachyrhamdia* clade, it is not found elsewhere within pimelodids and its appearance is congruent with the three characters, mentioned above, which define the *Brachyrhamdia* clade. The slender peduncle of the metapterygoid arm of the quadrate found in members of this clade is quite unlike comparable projections in other catfishes with bifid quadrates, a difference which can be taken as additional evidence of independent derivation of this structure in catfishes.

Within the *Brachyrhamdia* clade, Lundberg & McDade (1986) uncovered evidence of a more restricted group, containing the genera *Cetopsorhamdia, Goeldiella, Pimelodella, Rhamdella, Rhamdia, Typhlobagrus,* "*Pimelodus*" *heteropleura,* and an undescribed species superficially similar to the poorly defined *Nannorhamdia,* which is de-

fined by a notched and expanded transverse process of the fifth vertebra. The transverse process of *Nemuroglanis* is not of this form and, therefore, the taxon cannot be placed within that clade.

The resemblance between the shape of the transverse processes of the fifth vertebra of *Nemuroglanis* and the figured processes (Lundberg & McDade 1986) of *Nannorhamdia* lead to the discovery of yet another inclusive clade within the *Brachyrhamdia* clade. Numerous species share with *Nemuroglanis* the following suite of characters and are members of a distinct clade recognized here as the *Nemuroglanis* sub-clade:

1) The laminar portion of complex centrum transverse process, posterior to branched segment, is triangular and extends nearly to the lateral tip of the fifth vertebral transverse process. In other members of the *Brachyrhamdia* clade, this region does not project laterally more than one-half the distance to the tip of the transverse process of the fifth vertebra.

2) The first dorsal-fin basal pterygiophore is inserted behind Weberian complex, usually above vertebrae 7 to 10. In other members of the *Brachyrhamdia* clade and in general in catfishes, the first basal pterygiophore of the dorsal fin contacts the dorsal surface of the complex centrum and/or the fifth vertebra. In all members of the *Nemuroglanis* sub-clade, the first pterygiophore contacts the neural arches at, or posterior to, the sixth centrum.

3) The "dorsal-fin spine" is thin and flexible and the dorsal-fin lock (=first dorsal spine) is absent. Primitively, catfishes have the first two dorsal-fin rays modified into a stout, pungent spine and a more anterior, short locking element. Within the *Nemuroglanis* sub-clade, the element represented by the lock is absent and the pungent spine is, instead, a thin, segmented, unbranched ray.

4) The pectoral-fin "spine" is thin and flexible for its distal half, rather than pungent. As with the dorsal fin spine, above, the primitive condition for pimelodids is the presence of a pungent spine as the first ray of the pectoral fin. In members of the *Nemuroglanis* sub-clade, however, the first pectoral fin ray is stiffened for only the basal half. The distal half of the ray is unbranched and segmented and it is sometimes produced into a filament (e.g., *Nannorhamdia* sp. AMNH 74408).

The *Nemuroglanis* sub-clade may possibly include all members of the genera listed by Gosline (1941) as lacking a free orbital rim and having soft pectoral- and dorsal-fin spines. These include *Rhamdopsis, Acentronichthys, Heptapterus, Nemuroglanis, Cetopsorhamdia, Imparfinis, Pariolius,* and *Chasmocranus,* as well as the unlisted *Nannorhamdia.* Many of these genera are poorly diagnosed and, in all likelihood, polyphyletic, at present. Lundberg & McDade (1986) commented on this with respect to *Nannorhamdia,* placing one species within their restricted *Brachyrhamdia* clade, while illustrating a second species (their fig. 4c) which appears to belong to the clade described here. *Cetopsorhamdia* is also somewhat problematical. While the genus appears to belong to the *Nemuroglanis* subclade based on fin spine characteristics, Lundberg and McDade (1986) found the species examined by them to have the forked transverse process of the fifth centrum characteristic of the *Brachyrhamdia* sub-clade. While I have not had an opportunity to examine members of this genus, these examples point out the futility of trying to generalize, at this time, about the extent of these clades and emphasizes the urgent need to place members of the Pimelodidae into clades prior to attempting species level revisionary studies. Until that is done, the superficial resemblances among species, upon which the genera are currently based, will continue to confound the problem of defining genera and diminish the usefulness of resultant revisions for answering ques-

tions of evolution and biogeography of these fishes.

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